

**WHAT IS CLAIMED IS:**

1. A method for retrieving records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the method comprising:

5 identifying one of the records in the hierarchical set of the records;  
modifying the tag, thereby producing a key;  
indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the key to the hierarchical set of the records; and

10 retrieving the selected records.

2. The method of claim 1, wherein applying comprises:

selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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3. The method of claim 2, wherein identifying one of the records comprises:

receiving a selection of the one of the records from a user; and  
receiving a command from the user; and wherein  
modifying the tag is based on the command from the user.

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4. The method of claim 3, wherein each of the records has one or more fields, further comprising:

displaying a field of each of the retrieved records on a display, wherein the position of each of the fields on the display represents the hierarchical depth and hierarchical level of the corresponding one of the retrieved records.

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5. The method of claim 2, wherein:

each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels; and  
modifying the tag comprises:

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selecting at least one of the digits according to the command from the user;  
and  
changing the value of the selected digits according to the command from the  
user.

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6. The method of claim 2, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
10 the command from the user requests retrieving the children of the identified record;

and

modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth of the identified  
record; and

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setting the value of each digit corresponding to a hierarchical depth below the  
hierarchical depth corresponding to the selected digit to a wildcard value.

7. The method of claim 2, wherein:  
each tag is a number having a plurality of digits;  
20 the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
the command from the user requests retrieving the parent of the identified record; and  
modifying the tag comprises:

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selecting the digit corresponding to the hierarchical depth of the identified  
record; and

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setting the value of the selected digit to a null value.

8. The method of claim 2, wherein each of the records represents one of a  
message and a folder.

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9. A method for adding a new record to a hierarchical set of records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records in the hierarchical set of records having a tag that is unique within the hierarchical set of records, the method comprising:

5 identifying one of the records in the hierarchical set of records as the parent of the new record;  
modifying the tag, thereby producing a key;  
adding the key to the new record; and  
indexing the hierarchical set of records only once, thereby adding the new record to  
10 the hierarchical set of records, wherein indexing the hierarchical set of records only once comprises applying the key to the hierarchical set of records.

10. The method of claim 9, wherein identifying one of the records comprises:  
receiving a selection of the one of the records from a user.

11. The method of claim 10, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
20 the identified record represents a message;  
identifying one of the records further comprises receiving a command from the user that requests replying to the message; and  
modifying the tag comprises:  
selecting the digit corresponding to the hierarchical depth immediately below  
25 the hierarchical depth of the identified record; and  
incrementing the value of the selected digit.

12. The method of claim 9, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that  
30 matches the key.

13. The method of claim 9, wherein:  
each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

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14. A method for selecting records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the method comprising:  
identifying one of the records in the hierarchical set of the records;  
modifying the tag; and  
indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the modified tag to the hierarchical set of the record.

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15. The method of claim 14, wherein:  
each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

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16. The method of claim 14, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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17. At least one computer programmed to execute a process for retrieving records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the process comprising:

identifying one of the records in the hierarchical set of the records;  
modifying the tag, thereby producing a key;

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indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the key to the hierarchical set of the records; and retrieving the selected records.

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18. The computer of claim 17, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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19. The computer of claim 18, wherein identifying one of the records comprises:  
receiving a selection of the one of the records from a user; and  
receiving a command from the user; and wherein  
modifying the tag is based on the command from the user.

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20. The computer of claim 19, wherein each of the records has one or more fields,  
and the process further comprises:  
displaying a field of each of the retrieved records on a display, wherein the position of  
each of the fields on the display represents the hierarchical depth and hierarchical level of the  
corresponding one of the retrieved records.

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21. The computer of claim 18, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels; and  
modifying the tag comprises:

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selecting at least one of the digits according to the command from the user;  
and  
changing the value of the selected digits according to the command from the  
user.

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22. The computer of claim 18, wherein:

each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
the command from the user requests retrieving the children of the identified record;

5 and

modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth of the identified  
record; and

10 setting the value of each digit corresponding to a hierarchical depth below the  
hierarchical depth corresponding to the selected digit to a wildcard value.

23. The computer of claim 18, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

15 the value of each of the digits represents one of the hierarchical levels;

the command from the user requests retrieving the parent of the identified record; and

modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth of the identified  
record; and

20 setting the value of the selected digit to a null value.

24. The computer of claim 18, wherein each of the records represents one of a  
message and a folder.

25 25. At least one computer programmed to execute a process for adding a new  
record to a hierarchical set of records having a plurality of hierarchical levels and a plurality  
of hierarchical depths, each of the records in the hierarchical set of records having a tag that  
is unique within the hierarchical set of records, the process comprising:

30 identifying one of the records in the hierarchical set of records as the parent of the  
new record;

modifying the tag, thereby producing a key;

adding the key to the new record; and

indexing the hierarchical set of records only once, thereby adding the new record to the hierarchical set of records, wherein indexing the hierarchical set of records only once comprises applying the key to the hierarchical set of records.

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26. The computer of claim 25, wherein identifying one of the records comprises: receiving a selection of the one of the records from a user.

27. The computer of claim 26, wherein:

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each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

the value of each of the digits represents one of the hierarchical levels;

the identified record represents a message;

identifying one of the records further comprises receiving a command from the user

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that requests replying to the message; and

modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth immediately below the hierarchical depth of the identified record; and

incrementing the value of the selected digit.

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28. The computer of claim 25, wherein applying comprises:

selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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29. The computer of claim 25, wherein:

each tag includes a plurality of digits;

the position of each of the digits represents one of the hierarchical depths; and

the value of each of the digits represents one of the hierarchical levels.

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30. At least one computer programmed to execute a process for selecting records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of

hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the process comprising:

identifying one of the records in the hierarchical set of the records;

modifying the tag; and

5 indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the modified tag to the hierarchical set of the record.

10 31. The computer of claim 30, wherein:

each tag includes a plurality of digits;

the position of each of the digits represents one of the hierarchical depths; and

the value of each of the digits represents one of the hierarchical levels.

15 32. The computer of claim 30, wherein applying comprises:

selecting those of the records in the hierarchical set of the records having a tag that matches the key.

20 33. An apparatus for retrieving records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the apparatus comprising:

means for identifying one of the records in the hierarchical set of the records;

means for modifying the tag, thereby producing a key;

25 means for indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the key to the hierarchical set of the records; and

means for retrieving the selected records.

30 34. The apparatus of claim 33, wherein means for applying comprises:



means for selecting those of the records in the hierarchical set of the records having a tag that matches the key.

35. The apparatus of claim 34, wherein means for identifying one of the records  
5 comprises:

means for receiving a selection of the one of the records from a user; and  
means for receiving a command from the user; and wherein  
modifying the tag is based on the command from the user.

10 36. The apparatus of claim 35, wherein each of the records has one or more fields,  
further comprising:

means for displaying a field of each of the retrieved records on a display, wherein the  
position of each of the fields on the display represents the hierarchical depth and hierarchical  
level of the corresponding one of the retrieved records.

15 37. The apparatus of claim 34, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels; and  
20 means for modifying the tag comprises:

means for selecting at least one of the digits according to the command from  
the user; and

means for changing the value of the selected digits according to the command  
from the user.

25 38. The apparatus of claim 34, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
30 the command from the user requests retrieving the children of the identified record;

and

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means for modifying the tag comprises:

means for selecting the digit corresponding to the hierarchical depth of the identified record; and

means for setting the value of each digit corresponding to a hierarchical depth below the hierarchical depth corresponding to the selected digit to a wildcard value.

39. The apparatus of claim 34, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

the value of each of the digits represents one of the hierarchical levels;

the command from the user requests retrieving the parent of the identified record; and

means for modifying the tag comprises:

means for selecting the digit corresponding to the hierarchical depth of the identified record; and

means for setting the value of the selected digit to a null value.

40. The apparatus of claim 34, wherein each of the records represents one of a message and a folder.

41. An apparatus for adding a new record to a hierarchical set of records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records in the hierarchical set of records having a tag that is unique within the hierarchical set of records, the apparatus comprising:

means for identifying one of the records in the hierarchical set of records as the parent of the new record;

means for modifying the tag, thereby producing a key;

means for adding the key to the new record; and

means for indexing the hierarchical set of records only once, thereby adding the new record to the hierarchical set of records, wherein means for indexing the hierarchical set of records only once comprises means for applying the key to the hierarchical set of records.

42. The apparatus of claim 41, wherein means for identifying one of the records comprises:

means for receiving a selection of the one of the records from a user.

43. The apparatus of claim 42, wherein:  
each tag is a number having a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
the identified record represents a message;  
means for identifying one of the records further comprises means for receiving a  
command from the user that requests replying to the message; and  
means for modifying the tag comprises:

means for selecting the digit corresponding to the hierarchical depth  
immediately below the hierarchical depth of the identified record; and  
means for incrementing the value of the selected digit.

44. The apparatus of claim 41, wherein means for applying comprises:  
means for selecting those of the records in the hierarchical set of the records having a  
tag that matches the key.

45. The apparatus of claim 41, wherein:  
each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

46. An apparatus for selecting records in a hierarchical set of the records having a  
plurality of hierarchical levels and a plurality of hierarchical depths, each of the records  
having a tag that is unique within the hierarchical set of the records, the apparatus  
comprising:

means for identifying one of the records in the hierarchical set of the records;  
means for modifying the tag; and

means for indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein means for indexing the hierarchical set of the records only once comprises means for applying the modified tag to the hierarchical set of the record.

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47. The apparatus of claim 46, wherein:  
each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

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48. The apparatus of claim 46, wherein means for applying comprises:  
means for selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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49. Computer-readable media embodying instructions executable by a computer to perform a method for retrieving records in a hierarchical set of the records having a plurality of hierarchical levels and a plurality of hierarchical depths, each of the records having a tag that is unique within the hierarchical set of the records, the method comprising:

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identifying one of the records in the hierarchical set of the records;  
modifying the tag, thereby producing a key;  
indexing the hierarchical set of the records only once, thereby selecting one or more of the records within the hierarchical set of the records, wherein indexing the hierarchical set of the records only once comprises applying the key to the hierarchical set of the records; and  
retrieving the selected records.

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50. The media of claim 49, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that matches the key.

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51. The media of claim 50, wherein identifying one of the records comprises:  
receiving a selection of the one of the records from a user; and

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receiving a command from the user; and wherein  
modifying the tag is based on the command from the user.

52. The media of claim 51, wherein each of the records has one or more fields, the  
5 method further comprising:

displaying a field of each of the retrieved records on a display, wherein the position of  
each of the fields on the display represents the hierarchical depth and hierarchical level of the  
corresponding one of the retrieved records.

10 53. The media of claim 50, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

the value of each of the digits represents one of the hierarchical levels; and

modifying the tag comprises:

15 selecting at least one of the digits according to the command from the user;

and

changing the value of the selected digits according to the command from the

user.

20 54. The media of claim 50, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

the value of each of the digits represents one of the hierarchical levels;

the command from the user requests retrieving the children of the identified record;

25 and

modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth of the identified  
record; and

30 setting the value of each digit corresponding to a hierarchical depth below the  
hierarchical depth corresponding to the selected digit to a wildcard value.

55. The media of claim 50, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;

the value of each of the digits represents one of the hierarchical levels;

the command from the user requests retrieving the parent of the identified record; and  
modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth of the identified  
record; and

setting the value of the selected digit to a null value.

56. The media of claim 50, wherein each of the records represents one of a  
message and a folder.

57. Computer-readable media embodying instructions executable by a computer  
to perform a method for adding a new record to a hierarchical set of records having a  
plurality of hierarchical levels and a plurality of hierarchical depths, each of the records in  
the hierarchical set of records having a tag that is unique within the hierarchical set of  
records, the method comprising:

identifying one of the records in the hierarchical set of records as the parent of the  
new record;

modifying the tag, thereby producing a key;

adding the key to the new record; and

indexing the hierarchical set of records only once, thereby adding the new record to  
the hierarchical set of records, wherein indexing the hierarchical set of records only once  
comprises applying the key to the hierarchical set of records.

58. The media of claim 57, wherein identifying one of the records comprises:  
receiving a selection of the one of the records from a user.

59. The media of claim 58, wherein:

each tag is a number having a plurality of digits;

the position of each of the digits represents one of the hierarchical depths;  
the value of each of the digits represents one of the hierarchical levels;  
the identified record represents a message;  
identifying one of the records further comprises receiving a command from the user

5 that requests replying to the message; and  
modifying the tag comprises:

selecting the digit corresponding to the hierarchical depth immediately below  
the hierarchical depth of the identified record; and  
incrementing the value of the selected digit.

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60. The media of claim 57, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that  
matches the key.

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61. The media of claim 57, wherein:  
each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

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62. Computer-readable media embodying instructions executable by a computer  
to perform a method for selecting records in a hierarchical set of the records having a  
plurality of hierarchical levels and a plurality of hierarchical depths, each of the records  
having a tag that is unique within the hierarchical set of the records, the method comprising:  
identifying one of the records in the hierarchical set of the records;

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modifying the tag; and

indexing the hierarchical set of the records only once, thereby selecting one or more  
of the records within the hierarchical set of the records, wherein indexing the hierarchical set  
of the records only once comprises applying the modified tag to the hierarchical set of the  
record.

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63. The media of claim 62, wherein:

each tag includes a plurality of digits;  
the position of each of the digits represents one of the hierarchical depths; and  
the value of each of the digits represents one of the hierarchical levels.

5           64.     The media of claim 62, wherein applying comprises:  
selecting those of the records in the hierarchical set of the records having a tag that  
matches the key.

10           65.     A method of tagging a datum in a hierarchical data set having a plurality of  
hierarchical levels and a plurality of hierarchical depths, the method comprising:  
determining a hierarchical level of the datum;  
determining a hierarchical depth of the datum; and  
assigning a tag to the datum, comprising:  
15                 determining the immediate parent of the datum;  
selecting a tag of the immediate parent of the datum, wherein the tag is a  
number having multiple digits each representing one of the hierarchical depths of the  
hierarchical data set;  
selecting a digit of the selected tag that represents the hierarchical depth of the  
datum;  
20                 assigning a value to the selected digit, the value representing the hierarchical  
level of the datum.

25           66.     The method of claim 65, wherein assigning a value to the selected digit  
comprises:  
determining the number of children of the immediate parent of the datum that have  
already been tagged;  
incrementing the number of children to obtain an incremented number; and  
setting the value of the selected digit to equal the value of the incremented number.

30           67.     The method of claim 65, wherein:  
each datum represents a message;



the child of a datum represents a reply to the message represented by the datum; and  
the parent of a datum represents a message, a reply to which is represented by the  
datum.

5           68.    The method of claim 65, wherein:  
            each datum represents a container;  
            the child of a datum represents a container within the container represented by the  
datum; and  
            the parent of a datum represents a container which contains the container represented  
10    by the datum.

69.    At least one computer programmed to execute a process for tagging a datum  
in a hierarchical data set having a plurality of hierarchical levels and a plurality of  
hierarchical depths, the process comprising:

15           determining a hierarchical level of the datum;  
            determining a hierarchical depth of the datum; and  
            assigning a tag to the datum, comprising:  
                determining the immediate parent of the datum;  
                selecting a tag of the immediate parent of the datum, wherein the tag is a  
20    number having multiple digits each representing one of the hierarchical depths of the  
hierarchical data set;  
                selecting a digit of the selected tag that represents the hierarchical depth of the  
datum;  
                assigning a value to the selected digit, the value representing the hierarchical  
25    level of the datum.

70.    The computer of claim 69, wherein assigning a value to the selected digit  
comprises:

30           determining the number of children of the immediate parent of the datum that have  
already been tagged;  
            incrementing the number of children to obtain an incremented number; and

setting the value of the selected digit to equal the value of the incremented number.

71. The computer of claim 69, wherein:

each datum represents a message;

5 the child of a datum represents a reply to the message represented by the datum; and  
the parent of a datum represents a message, a reply to which is represented by the  
datum.

72. The computer of claim 69, wherein:

10 each datum represents a container;

the child of a datum represents a container within the container represented by the  
datum; and

the parent of a datum represents a container which contains the container represented  
by the datum.

15 73. An apparatus for tagging a datum in a hierarchical data set having a plurality  
of hierarchical levels and a plurality of hierarchical depths, the apparatus comprising:

means for determining a hierarchical level of the datum;

means for determining a hierarchical depth of the datum; and

20 means for assigning a tag to the datum, comprising:

means for determining the immediate parent of the datum;

means for selecting a tag of the immediate parent of the datum, wherein the  
tag is a number having multiple digits each representing one of the hierarchical  
depths of the hierarchical data set;

25 means for selecting a digit of the selected tag that represents the hierarchical  
depth of the datum;

means for assigning a value to the selected digit, the value representing the  
hierarchical level of the datum.

30 74. The apparatus of claim 73, wherein means for assigning a value to the selected  
digit comprises:

means for determining the number of children of the immediate parent of the datum that have already been tagged;

means for incrementing the number of children to obtain an incremented number; and

means for setting the value of the selected digit to equal the value of the incremented

5 number.

75. The apparatus of claim 73, wherein:

each datum represents a message;

the child of a datum represents a reply to the message represented by the datum; and

10 the parent of a datum represents a message, a reply to which is represented by the datum.

76. The apparatus of claim 73, wherein:

each datum represents a container;

15 the child of a datum represents a container within the container represented by the datum; and

the parent of a datum represents a container which contains the container represented by the datum.

20 77. Computer-readable media embodying instructions executable by a computer to perform a method for tagging a datum in a hierarchical data set having a plurality of hierarchical levels and a plurality of hierarchical depths, the method comprising:

determining a hierarchical level of the datum;

determining a hierarchical depth of the datum; and

25 assigning a tag to the datum, comprising:

determining the immediate parent of the datum;

selecting a tag of the immediate parent of the datum, wherein the tag is a number having multiple digits each representing one of the hierarchical depths of the hierarchical data set;

30 selecting a digit of the selected tag that represents the hierarchical depth of the datum;

assigning a value to the selected digit, the value representing the hierarchical level of the datum.

78. The media of claim 77, wherein assigning a value to the selected digit comprises:  
determining the number of children of the immediate parent of the datum that have already been tagged;  
incrementing the number of children to obtain an incremented number; and  
setting the value of the selected digit to equal the value of the incremented number.

79. The media of claim 77, wherein:  
each datum represents a message;  
the child of a datum represents a reply to the message represented by the datum; and  
the parent of a datum represents a message, a reply to which is represented by the datum.

80. The media of claim 77, wherein:  
each datum represents a container;  
the child of a datum represents a container within the container represented by the datum; and  
the parent of a datum represents a container which contains the container represented by the datum.

81. A unique tag for a datum in a hierarchical data set having a plurality of hierarchical levels and a plurality of hierarchical depths, comprising:  
a number having a plurality of digits, each digit representing one of the hierarchical depths of the hierarchical data set; and wherein  
the position of the least-significant non-zero digit represents the hierarchical depth of the datum;  
the value of the least-significant non-zero digit represents the hierarchical level of the datum; and

the digits that are more significant than the least-significant non-zero digit represent parents of the datum.

82. A memory for storing data for access by an application program being  
5 executed on a data processing system, comprising:

a data structure stored in the memory, the data structure comprising a hierarchical  
data set having a plurality of hierarchical levels and a plurality of hierarchical depths, the  
hierarchical data set comprising a unique tag for a datum comprising:

10 a number having a plurality of digits, each digit representing one of the  
hierarchical depths of the hierarchical data set; and wherein  
the position of the least-significant non-zero digit represents the hierarchical  
depth of the datum;  
the value of the least-significant non-zero digit represents the hierarchical  
level of the datum; and  
15 the digits that are more significant than the least-significant non-zero digit  
represent parents of the datum.

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